great to make an effort to save the limb. Yet the result in these five consecutive cases, under the most favourable circumstances, adds but another proof to what has long ago been recorded by Guthrie, Ballingall, Larrey, Macleod, and many other writers on military surgery, that the only hope for any one, when the knee-joint has been opened by a gunshot wound, is in immediate amputation. Had these cases been amputated on the field, instead of sending them to the general hospital, there is every reason to believe that three out of the five might have been saved.

ART. V.—*Remarkable Case of Vesical and Urethral Calculi, in a Boy Twelve Years old. Forty-five Stones successfully removed from the Bladder.* By J. F. SANFORD, M. D., of Keokuk, Iowa. With three Woodcuts.

WILLIAM ELLIOTT, aged twelve years, applied to me for surgical treatment, December 13, 1862. I obtained the following history of the case from his father:—

He is a native of Pasquotank County, North Carolina. His figure is slight and his constitution much impaired by frequent attacks of illness. During infancy he suffered from protracted cholera infantum, which continued, more or less, till he was three years old. At that age, or a little later, he was attacked with hooping cough, which continued through an entire winter, attended with symptoms of unusual severity. This disease brought on repeated and copious hemorrhages from the lungs, and, when it subsided in the spring, left him much emaciated. During the succeeding summer, and before his health was entirely restored, symptoms of stone in the bladder made their appearance, causing considerable pain and slight straining in urination; at the same time obstruction to the free flow of the water occurred, which sometimes required energetic treatment for its removal.

These paroxysms occurred about once a week with but little variation in their severity until the spring of 1857. At this time they became much more painful and occurred more frequently. Incontinence of urine was now added to the sufferings of the patient, and every effort at micturition occasioned distress. In 1858 he had an attack of measles. This increased the pre-existing morbid condition and rendered the boy's agony almost insupportable. Some time in August last—1862—inflammation was developed in the perineum, attended with the usual symptoms of pain, swelling, &c., which continued with unabated severity—involving the scrotum and neighbouring parts—until suppuration and ulceration resulted establishing the condition of fistula in perineo. At one time during the greatest intensity of this local condition, when extravasation of urine into the cellular tissue had occurred, the inflammatory tumefaction exceeded an orange in size, and threatened extensive gangrene and sloughing of the parts. This finally subsided under treatment to the size of a walnut, the surface presenting five or six perforations, through which the urine constantly dribbled. During the height of the local inflammation, the constitutional symptoms were very severe, and for some weeks the patient's life was despaired of. After it partially subsided he remained very weak and irritable, and the symptoms of stone in the bladder, before detailed, were much aggravated.

The history of the case above given will enable the reader to appreciate the condition of the patient at the time of his arrival in the city in search of relief. His emaciation was extreme and his sufferings indescribable. When I first saw him lying on his bed, I supposed it was some one suffering the intense pain of a recent injury. The head was bent down nearly to the knees, which were grasped by the hands, and the countenance, pale and thin, was expressive of the utmost agony. The intensity of the pain intermitted every five or ten minutes, not to be followed by ease or rest, but only to a degree more endurable by the patient; but I do not think during that day, or for several days after, whilst under my immediate observation, he passed an hour at any one time free from severe pain.

The case being thus attended with such extreme suffering, and otherwise presenting many points of more than ordinary interest, I allowed his father, who accompanied him, to prepare an upper room in my building for his reception, where I could have him under my hourly notice. The day after his arrival I made an inspection of the external parts, and found them presenting the following appearance:—

The prepuce, elongated at least an inch beyond the glans, was slightly red and tumefied; the lower part of the scrotum was enlarged and indurated, and below it, about half an inch, was a regularly circumscribed tumour, an inch in diameter, and elevated three-quarters of an inch above the surrounding surface. This tumour was inflamed and irritable, and perforated with five small openings, through which the urine would pass in small jets during each paroxysm of pain. A small portion of urine would also occasionally pass out through the natural channel. Still below this tumour the parts—that is, the perineum between it and the anus—were swollen and tender, a condition much aggravated during the straining pain which occurred so frequently.

Notwithstanding the local inflammation had greatly subsided, and consequently the fever had measurably passed away, the system was extremely irritable. The pulse during the week before the operation was seldom found below 120, the skin was hot and dry, the tongue coated, the thirst considerable, and the appetite weak and capricious.

Under these circumstances the sounding was postponed until the third day after the patient's arrival, and in the meantime his bowels were opened by gentle laxatives, mucilaginous and slightly alkaline drinks enjoined, and a few hours before he was sounded eight grains of Dover's powder were given.

This course having allayed to some extent the irritable condition, I proceeded in the presence and with the assistance of Drs. Whinnery, of Fort Madison, and Sala, of West Point, to sound him. The sound, a No. 8 steel bougie, was passed with some difficulty along the urethra into the bladder, encountering in its way two stones—one at the point of the perineal tumour above described, and the other three-fourths of an inch beyond. The instrument passed these calculi readily, but impinged closely upon their surfaces. The space intermediate between them, as also the urethra between the second stone and neck of the bladder, appeared to be contracted, and opposed an obstacle to the onward progress of the sound. This contraction appeared greatest in the prostatic portion of the urethra, and for some time it seemed impossible to reach and enter the bladder. When by gentle perseverance this was accomplished, the nature of the case became obvious, and nothing remained but to prepare the patient for the necessary operation. This was done by putting him on a light, but nutritious diet, keeping the bowels open with mild laxatives, and enjoining mucilaginous and slightly alkaline drinks.

Operation.—The patient came to me December 13th, 1862, and by the 20th I considered him sufficiently prepared for the operation of lithotomy. On the evening of the 19th he took a dose of castor oil, and on the morning of the 20th the rectum was well emptied by tepid water injection. Having prepared means to meet the exigencies of a complex and difficult operation, I proceeded to its execution on the day stated, in the presence of several medical gentlemen and students, but particularly assisted by Dr. E. M. Sala, of West Point. The incision was made as usual in the performance of the lateral operation, except that it was begun a little higher, in order to approach the seat of the fistulous openings as nearly as possible, so as to facilitate the removal of the urethral calculus there located. On reaching the staff, it was found considerably to the right of the raphé or middle line, having been so deflected by the large urethral stone. I could not perceive at this point the ordinary circumscribed tissue of the urethra, but only a general expansion of all the tissues, forming a cavity in which it now appeared, a large calculus was lodged. Ascertaining by the finger and probe the dimensions of the stone, the cavity was opened to the extent of an inch upon the staff, which was then withdrawn. The forceps were now applied as well as possible to the calculus and an attempt made to extract it; but after repeated trials it appeared impossible to accomplish it in this way. It seemed to be so firmly impacted that the forceps could not grasp it with sufficient firmness; they would slip off, fracturing the external layer, but leaving the main body of the stone unmoved. I now took a steel gouge, slightly curved at the cutting end, and carefully insinuating it alternately around either side of the stone, succeeded at last in dislodging it from its bed. Its location was at the proper site of the membranous portion of the urethra, but we could trace no vestige of the normal structure; the cavity extended from the anterior margin of the prostate gland to the bulb of the urethra, and to the extent of half an inch or more on either side of the median line. Beyond this cavity the urethra, that is the prostatic portion, seemed to be less than the usual size, and, as far as I could see, this contraction embraced its entire extent.

I now passed a small silver female catheter into the bladder to be used as a sound, and found that organ literally crowded with stones, the grating upon the instrument and upon one another as they were moved about by it, being quite audible. It was now necessary to extend the incision, and to accomplish this a straight staff was introduced, into the groove of which the point of a beaked scalpel was placed and pushed, properly lateralized, through the prostate into the bladder. Through this incision, after dilatation with the finger, the forceps were passed, and one after another several of the larger stones removed. The scoop was then substituted and the bladder emptied of its contents, with the exception of a considerable quantity of debris lying in the *bas fond*, and some gritty and scaly matter adhering to the walls. After clearing this latter from the mucous membrane with the finger passed in every direction around the cavity, it was thoroughly washed out by repeated and forcible injections of warm water. After a careful examination of the spongy portion of the urethra, the operation was considered complete. It was done in less than fifteen minutes, the patient being under the full influence of chloroform and unconscious of any suffering during the entire period thus occupied. It was the opinion of all present that less than an ounce of blood was lost during the operation. The patient rested well during the day and night following, being entirely free from pain, and enjoying a night's calm repose, to which, for years, he had been a stranger. No febrile reaction occurred, not the slightest inflammatory action manifested itself in the pelvic or abdominal viscera, and in fact we may say, without noting a single exception, that the patient rapidly recovered without an unfavourable symptom.

At the end of two weeks, the wound being nearly closed, we deemed it expedient to introduce and retain a silver catheter. The alteration of the tissues produced by long continued disease and the presence of foreign bodies in the urethra, endangered its occlusion in a considerable portion of its extent during the process of union and repair, and this, together with the yet unclosed condition of the fistulous openings near the scrotum, rendered the use of a catheter necessary. There were circumstances connected with the morbid condition at the seat of these fistulæ, that precluded the probability of their cure, even by the use of this instrument. There were several openings; they had been protracted and obstinate, and lastly, the internal opening was very large. I therefore determined to lay open the parts by an external incision and heal them over the silver catheter. This was accordingly done, the incision being made upon a staff. In carrying the knife through the parts it was evident that a calculus was imbedded in the swollen and indurated parts external to the urethra. Its situation entirely outside of that canal, caused us to miss it in our search for more stones after the operation was deemed complete. Not being prepared at the moment of its discovery to extend the operation and remove it, that proceeding was postponed and the wound dressed. In removing the dressings subsequently the stone came away with them. It is of the size and shape represented by Fig. 1.

The swelling and redness now rapidly subsided, and in the course of a few days the wound had closed with the exception of a small orifice not larger than a pin's head. The patient's general health in the meantime rapidly improved, and he left for home on Tuesday, Jan. 20th, 1863.

Owing to the strongly marked diathesis and tendency to relapse existing in this case, the patient was put upon the occasional use of nitric acid, a daily cool bath directed, and a plain nutritious diet and exercise in the open air enjoined.

Number and composition of the stones.—It was our impression at the time the stones were being removed that they did not number more than eight or ten. Their softness, friability, and covering of mucus and blood, prevented a correct estimate of their number, and created the impression that they were broken into numerous fragments by contact with the instruments during extraction. But after being cleansed in the most careful manner, they were closely scrutinized and counted in the presence of Drs. Sala and Pittman, and every one not presenting an entire unbroken surface was excluded. There were 47 of these distinct calculi, and of those showing more or less of a fractured surface, over 100. They are of every shape and obscurely laminated. The largest perfect stone is the one which was imbedded in the membranous portion of the urethra, the size and form of which is here shown (Fig. 2).

Fig. 1.

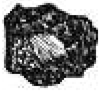

Fig. 2.

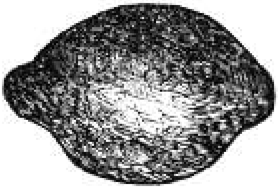

Fig. 1.—Actual size and shape of small Urethral Stone located in *cul-de-sac* at spongy portion of the Urethra.
Fig. 2.—Large stone located in the membranous portion of the Urethra.

This stone measures three inches and three-quarters in its long, and three inches in its short circumference. The largest vesical calculus is two inches and a half in circumference—the smallest about the size of a pea. The aggregate mass of the fragmentary portions would exceed in bulk the larger urethral stone. The aggregate weight is within a small fraction of two ounces. The mass thus described filled the bladder, which was closely contracted around it, and forcing, by its spasmodic action, the stones into the vesical triangle and neck, thus arresting the function of the *sphincter vesicæ*, and causing the leaking and dribbling of urine before alluded to. The following illustration is designed to represent this condition :—

Fig. 3.

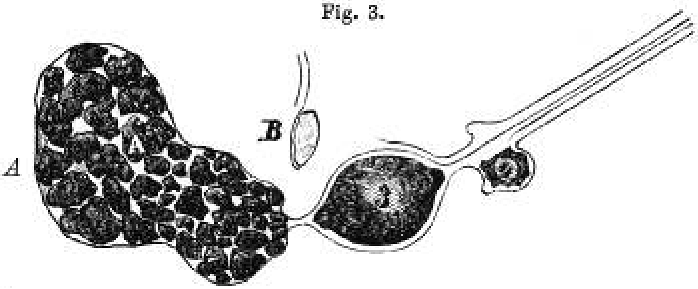

Fig. 3.—Showing Bladder, Urethra, &c. *A.*—Bladder full of stones. *B.*—Pubic Bone. 4.—Small Urethral Stone. 3.—Large stone in membranous portion of the Urethra. Between the neck of the bladder and the large stone is seen the prostatic portion of the Urethra, contracted by disease and structural change.

It may well be imagined that a bladder thus situated, and subject for years to the presence of foreign bodies provoking irregular and spasmodic action, would become the seat of morbid alterations of form and structure. Such alterations were quite obvious in this case. The form of the organ was elongated and contracted slightly in the middle, as above represented, whilst there was an irregular thickening of the coats, as is sometimes apparent from hypertrophy of the muscular fibres. This was so great in some portions of the organ as to resemble the retiform arrangement existing in columniform bladder.

From the appearance and obvious character of these stones, we had but little doubt as to their chemical composition. They were pale coloured, of earthy texture, smooth and soft. A section of any particular stone exhibited a uniformity throughout the mass. From these indications we believed them to be composed of the triple phosphate of ammonia, magnesia, and lime, but as, in a case of so much importance, it was desirable to establish the fact of their composition as clearly as our means would allow, we subjected them to a careful analysis. This process had reference, of course, only to the qualitative investigation, but the experiments and application of the tests were decisive and satisfactory. The following is briefly the method pursued in which I had the assistance of my pupil, Mr. J. A. Webster:—

A portion of the calculus placed on platinum wire was subjected to the action of the blow-pipe, by which it was speedily blackened. This result was due to the animal matter always present in earthy calculi. It then became white, and by continued action of the flame was imperfectly fused into a kind of vitreous grit. During the process a distinct ammoniacal odour was exhaled. A portion of the incinerated mass was then dissolved in chemically pure nitric acid diluted, and this solution divided into two parts. One part was taken, and after neutralizing the excess of acid by a solution of the bicarbonate of potash, it was tested with a strong solution of nitrate of silver, which produced a beautiful yellow precipitate. This precipitate was phosphate of silver, and thus demonstrated the presence of phosphoric acid. The second part of the solution was *nearly* neutralized with ammonia; to this a solution of oxalate of ammonia was added, which after a short interval produced a white crystalline deposit. This precipitate was the oxalate of lime. After it had entirely subsided, the clear liquid was poured off, and this liquid, when tested with caustic ammonia, produced a crystalline precipitate of triple phosphate. To this demonstration of the presence of magnesia was added other familiar tests. This analysis, thus limited to a qualitative definition, was more elaborate and varied than here described, and to our minds was sufficiently satisfactory.

ART. VI.—*Hospital Gangrene as it appeared in St. John's College Hospital, Annapolis, Md.* By JAS. W. PITTINOS, Asst. Surgeon 67th Regt. Pa. Vols.

ON the morning of Jan. 11th, the steamer New York arrived at this port, bringing a large number of sick and wounded from Richmond, Va., the majority of whom were wounded at Fredericksburg, Dec. 13th, 1862, and had been treated in the Libby Prison Hospital.

At the time of their admission into this hospital, the wounds presented no unusual appearance, with the exception of those of Henry Larke, of whom I shall speak presently. Our hospital has had every attention bestowed upon it to prevent the origin of any disease, which is produced by filth, bad ventilation, &c., and from what I have learned since, I am satisfied that the disease was brought from Richmond in the New York, as I have been informed by an intelligent officer that it prevailed there to a considerable extent, and that many had died.